view of the similarities established both in the field of chemotherapy and that of experimental carcinogenesis, much importance is given to a comparison of human and animal data. Such comparisons gain importance if the human and animal data are consistent with one another. For instance, positive animal experimental data on tobacco tar gain significance because of established human data.

Studies on the relative risk of lung cancer show the risk to have been increased in proportion to the increased amount of tobacco consumed.[1] Data on risk have also been established in terms of absolute risk, by Hammond and Horn[2] and by Doll and Hill.[3] Hammond and Horn[2] have shown that the incidence of lung cancer per 100,000 persons is 278 for a person smoking two packs of cigarettes a day, 119 for a person smoking one to two packs of cigarettes a day, 61 for a person smoking between one half and one pack a day, and 4.5 for a nonsmoker. It should be realized that, in addition to difficulty in determining the rates in certain groups because of sample sizes, there is a lack of control over the dose variable.

Doll and Hill's[3] data showed the death rate per 100,000 among British physicians to be 205 for those smoking 25 gm. of tobacco or more, 106 for those smoking between 15 and 21 gm. a day, 58 for those smoking between 1 and 14 gm. a day, and 9 for nonsmokers. Because of the number of cases involved in these studies an exact comparison is again less significant than the general trend.

Thus studies for man have shown the risk of lung cancer to increase in proportion to the increase in the amount of tobacco smoked.

There are several reasons why both similarities and differences can be expected when a dose-response curve for mice is compared with a corresponding curve for man. These reasons, for instance, would include differences in tissue susceptibility to the toxic effects of cigarette tar.

For mice, present data indicate that an exposure to 2.5 gm. per year does not or only rarely does, induce tumors. Although it is difficult to estimate a comparable exposure level for man, the human data in line with the animal data indicate that a reduction in total tar exposure will be followed by a decrease in tumor formation. For this reason, measures directed toward this reduction are of utmost importance.

Measures that can succeed in reducing the tar exposure of man include the following:

1. More effective filtration. It seems feasible to produce a filter that will remove 40 per cent of the tar from a given cigarette and still allow the cigarette to maintain a satisfactory pressure drop and flavor.

2. Modification in the types of tobacco so that the blend used is as low as possible in tar and nicotine content.

3. Regulation of the size of the cigarette so that the lowest amount of tar possible is yielded.

These measures, together with moderation of smoking habits, can effectively reduce the cancer risk of smokers. It may be predicted that if the average smoker were exposed to only one half the amount of tobacco tar to which the smoker of regular-sized cigarettes is now exposed, his cancer risk would be significantly reduced. Any measure designed to thus reduce man's exposure to tobacco tar, whether through modification of the tobacco or the cigarette, or through more effective filtration, can significantly contribute to the decrease in risk.

Summary and Conclusions

1. The purpose of the present study was to determine the dose-response level of tobacco tar in mice. This was done by varying the duration, frequency, and concentration of tobacco-tar application.

2. There is an optimum as well as a minimum concentration of tobacco tar that will produce papillomas and cancers in mice. The optimum concentration is in part dependent upon the toxicity of the tobacco tar.

3. The minimum dose of tar capable of producing papillomas in mice is about one third, and of producing cancer one half, that of the optimum dose.

4. The practical implications of these data and their relationship to the human cancer problem have been emphasized.

References

1. Cutler, S. J., and Lovland, D. B.: Risk of developing lung cancer and its relationship to smoking. *J. Nat. Cancer Inst.* 15: 201-211, 1954.

2. Doll, R., and Hill, A. B.: Lung cancer and other causes of death in relationship to smoking; second report on mortality of British doctors. *Brit. M. J.* 2: 1071-1081, 1956.

3. Graham, E. A.; Cronkite, A., and Wynder, E. L.: Experimental production of carcinoma with cigarette tar; III, occurrence of cancer after prolonged